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HOFFMAN-SINGLETON GRAPH AND OVALS IN THE PROJECTIVE PLANE OF ORDER 5

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The Hoffman-Singleton graph is the unique Moore graph with degree 7 and diameter 2. There is a long-standing open problem surrounding this graph. Can 7 of its copies be packed into the complete graph K_{50} such that they are edge-disjoint? In 2003, Šiagiová and Meszka used methods from topological graph theory to construct a set of five edge-disjoint copies of the Hoffman-Singleton graph in K_{50} which share a common group of automorphisms of order 25.

We completely classify all possible edge-disjoint quintuples of Hoffman-Singleton graphs that share such an automorphism group and show their correspondence to special sets of ovals in projective plane of order 5. We also search for similar sets of ovals in projective planes of higher orders.